TYNDP 2014
Methodology in assessment phase

RG Baltic Sea

System Adequacy and Market Modeling

Knut Hornnes, Statnett

RGBS Stakeholders meeting - 10/04/13

entsoe

Reliable Sustainable Connected

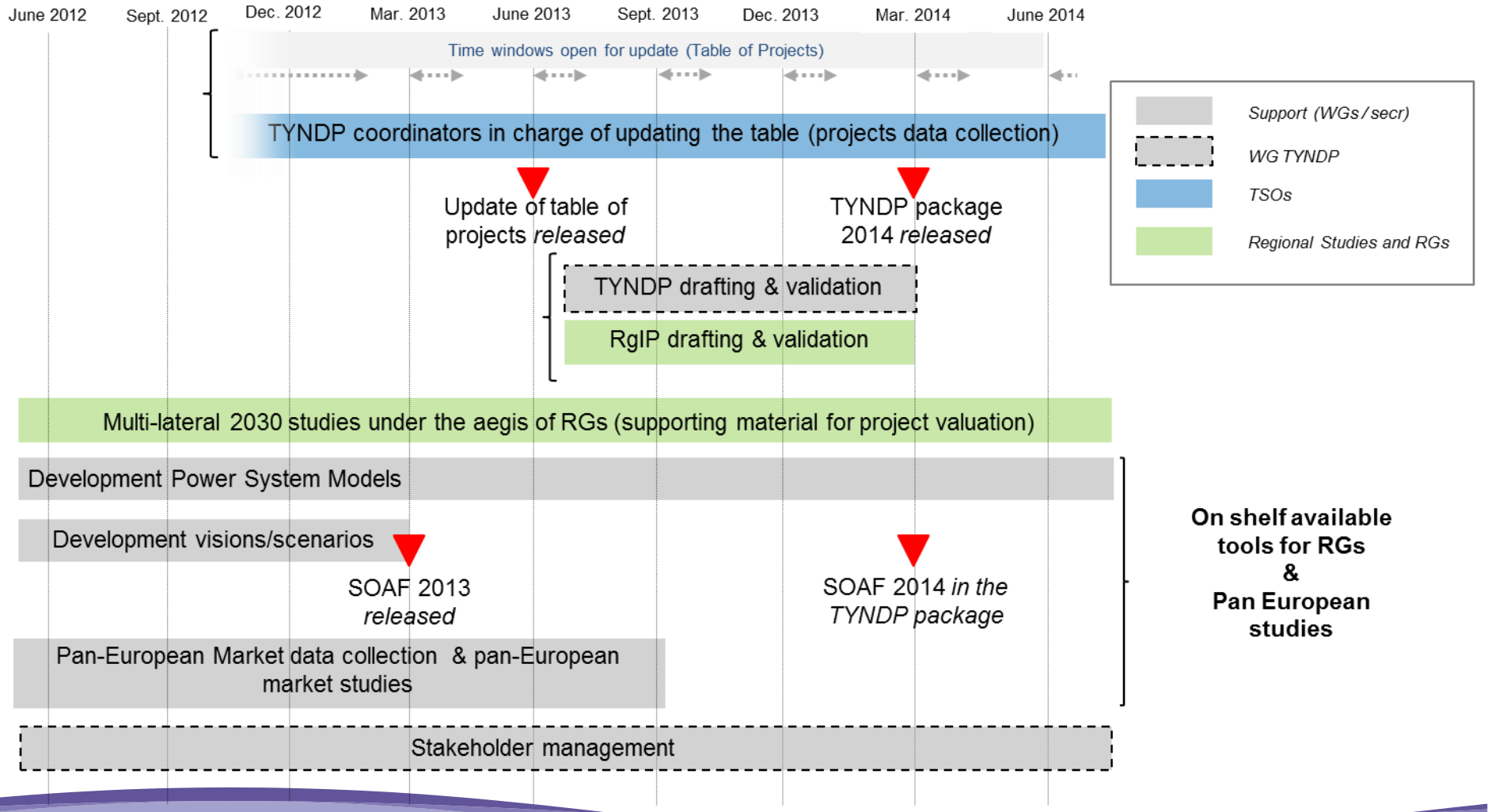
Outline

- **Drivers for grid development**
- **Macro procedure and workplan**
- **Assessment phase methodology**
- **Perspectives towards 2030**
- **Indicators in assessment phase**

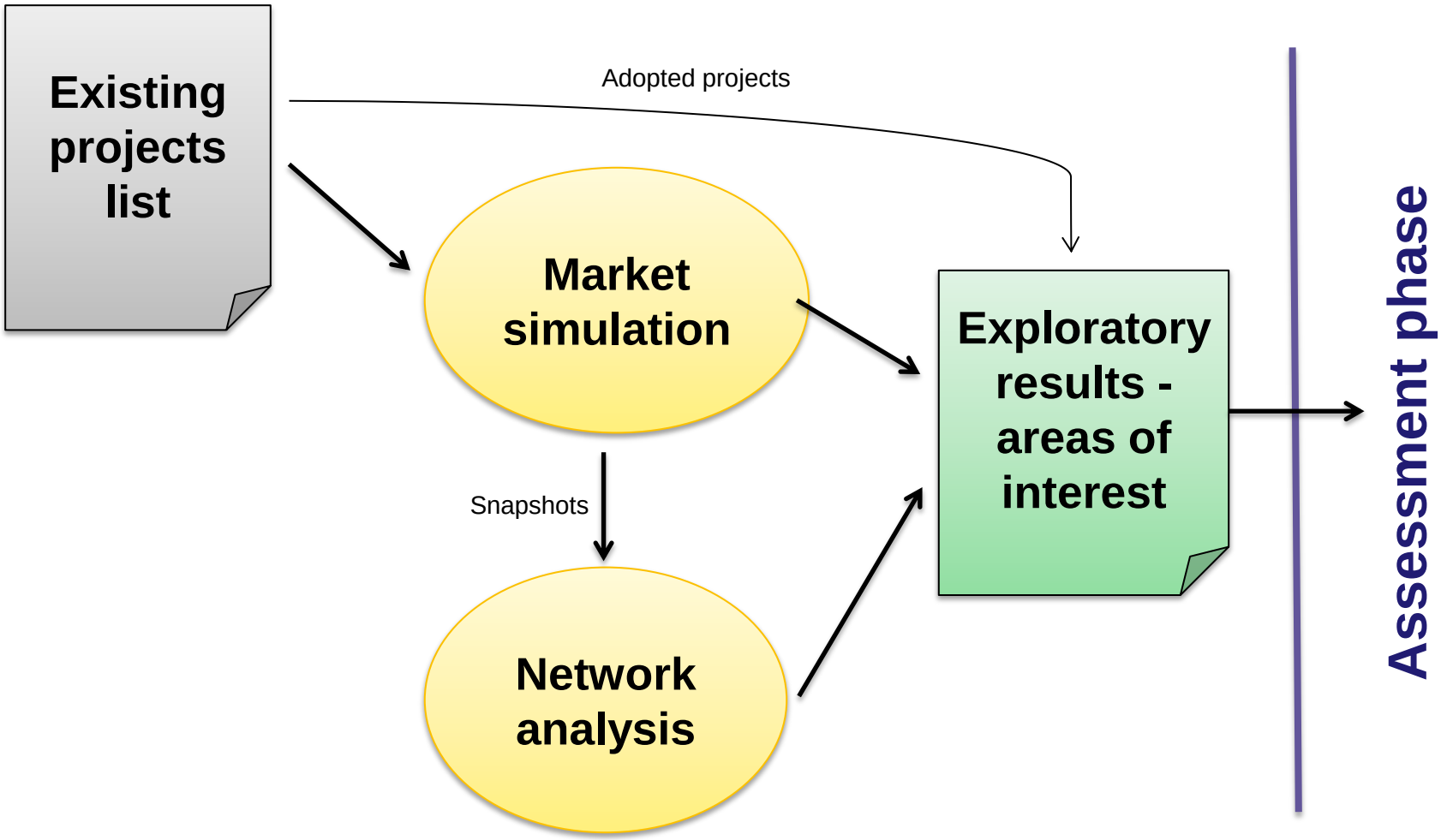
Drivers for grid development

- **The green revolution**
  - **More RES production**
  - **Balancing power**
  - **Transmission corridors**
- **Market integration**
  - **Baltic states synchronization with CE**
  - **Russian market developments unclear**

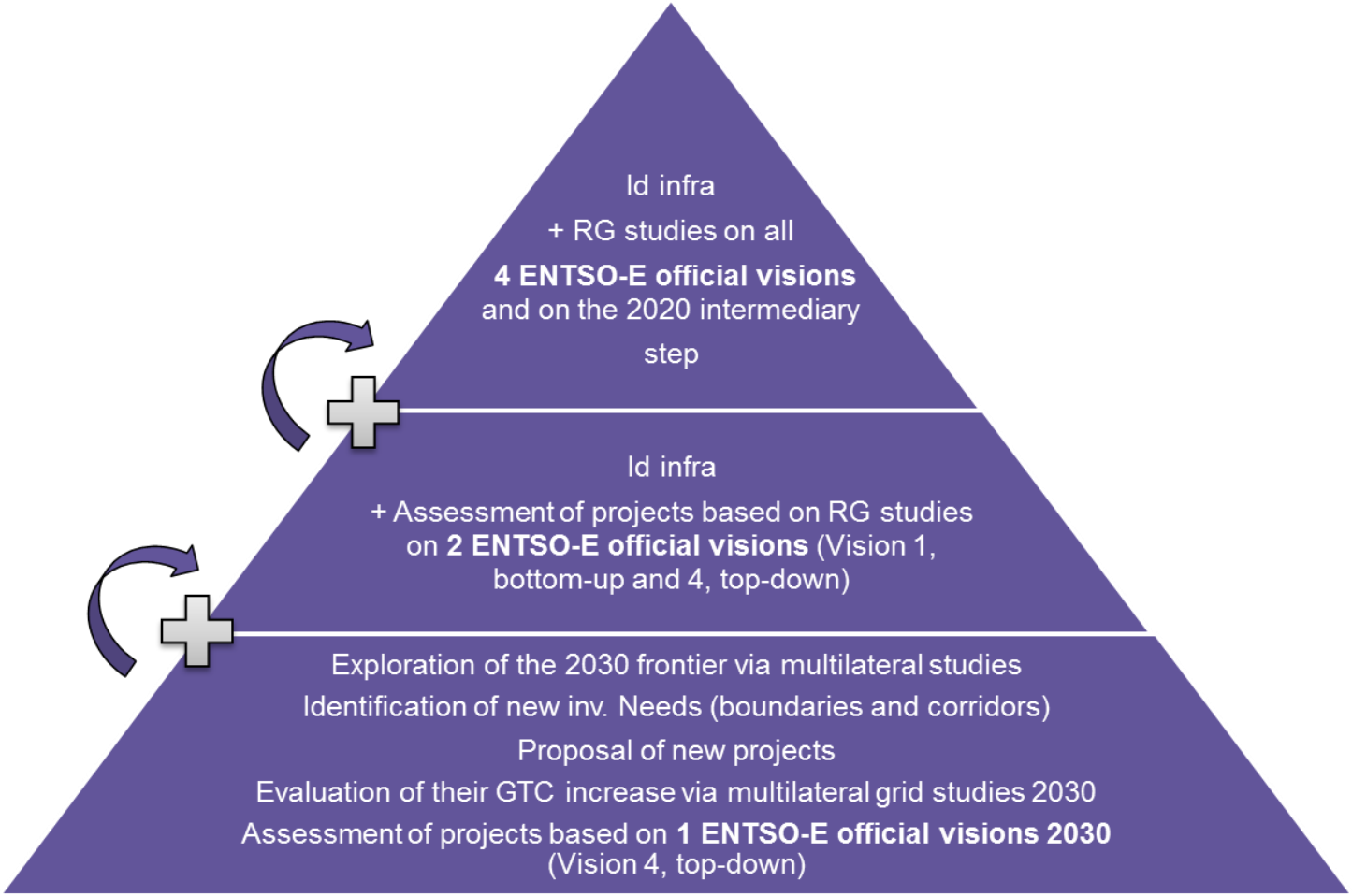
MACRO procedure

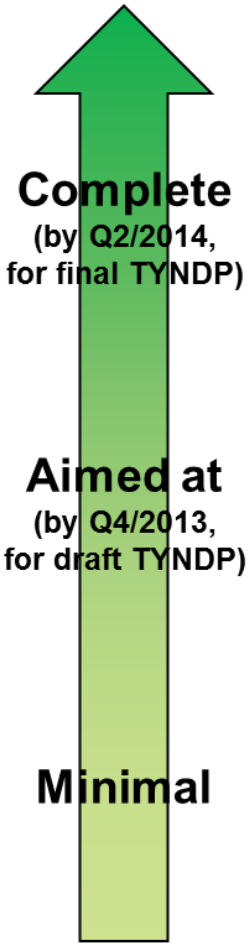


Exploratory phase – TYNDP 2014



Quality levels for RG studies

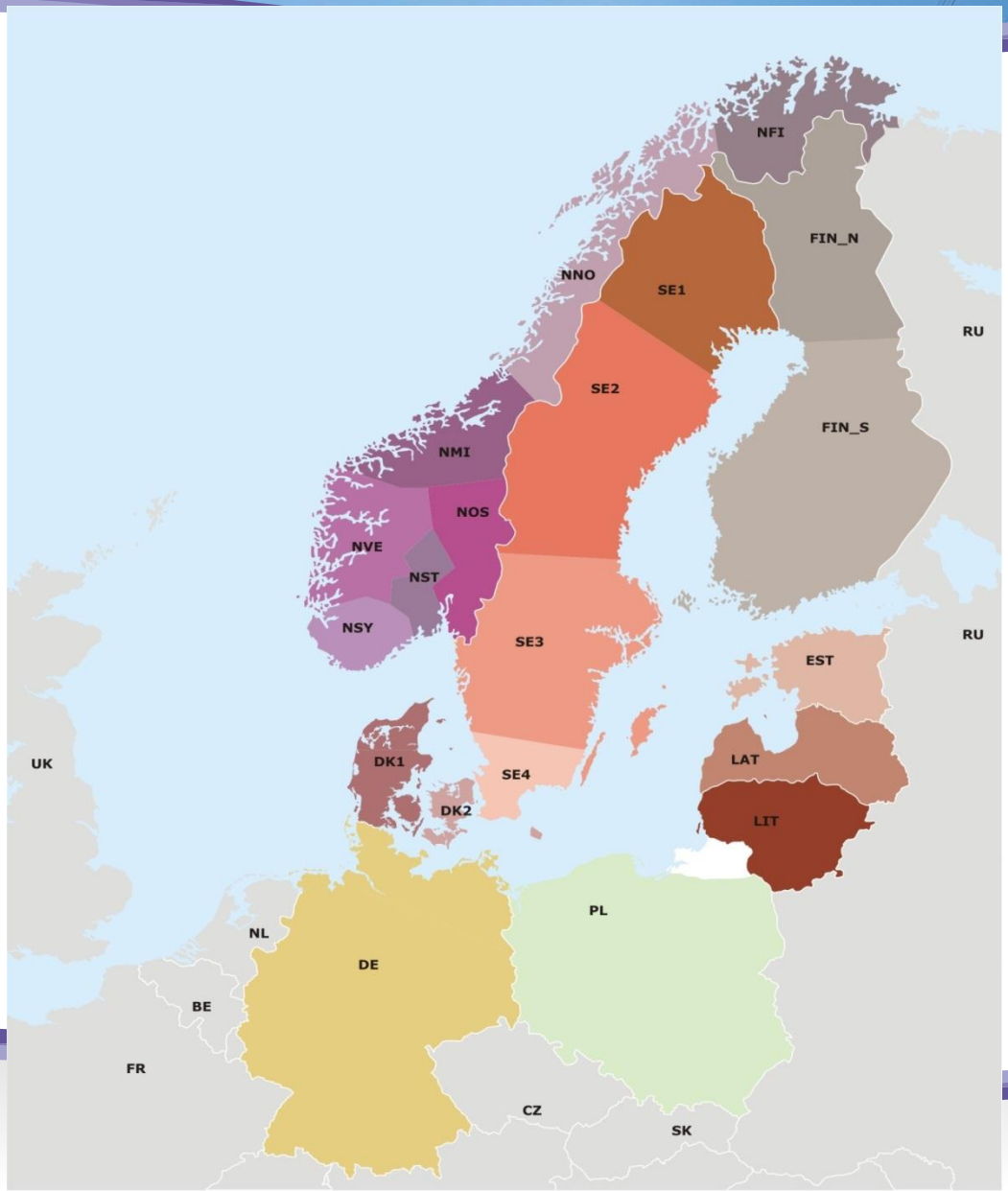




Market simulations

- **BID model as market simulator**
  - **Based on Linear Programming**
  - **Transmission capacities between areas**
  - **Simplified hydro modeling**

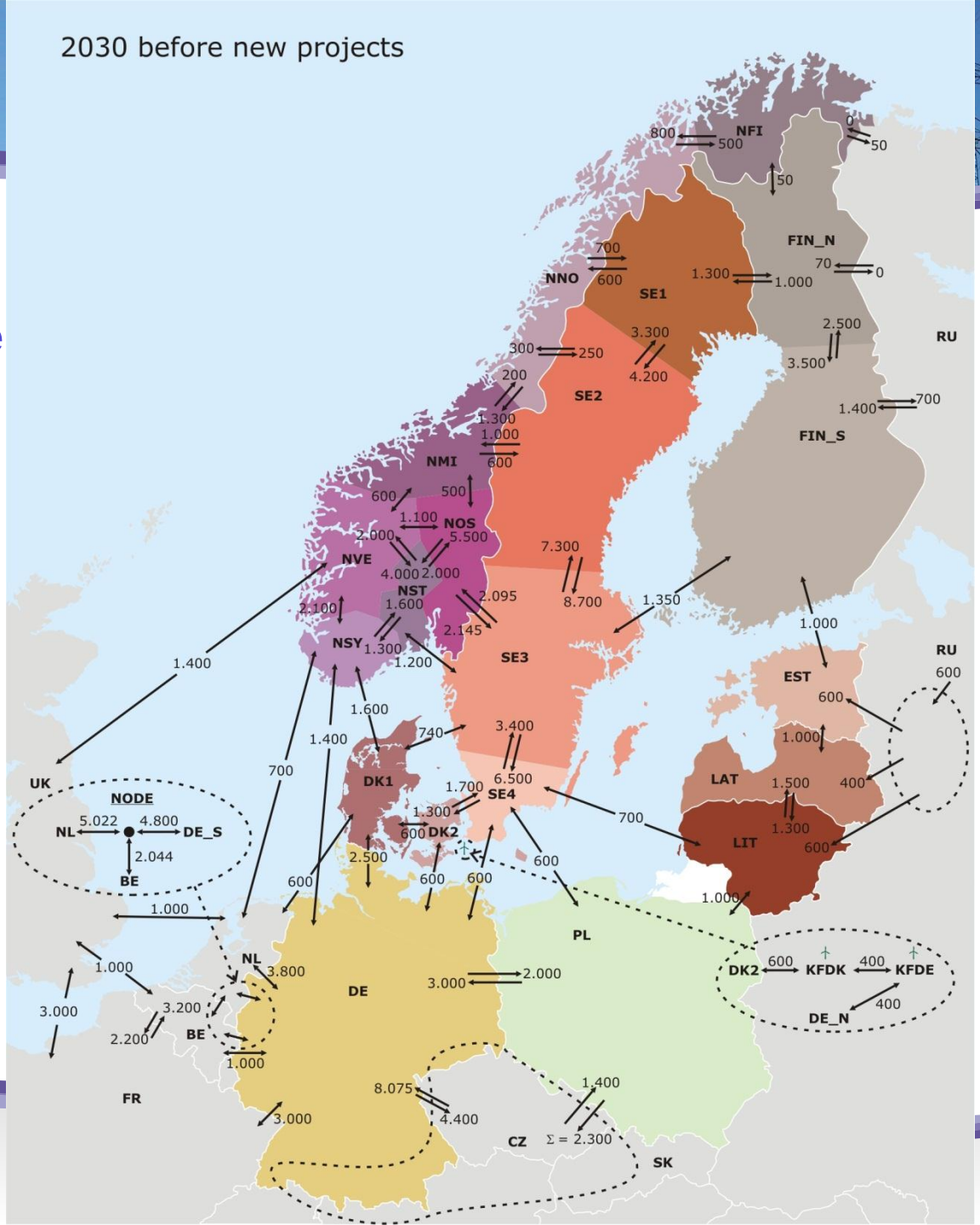
Market modelling and areas in BID model



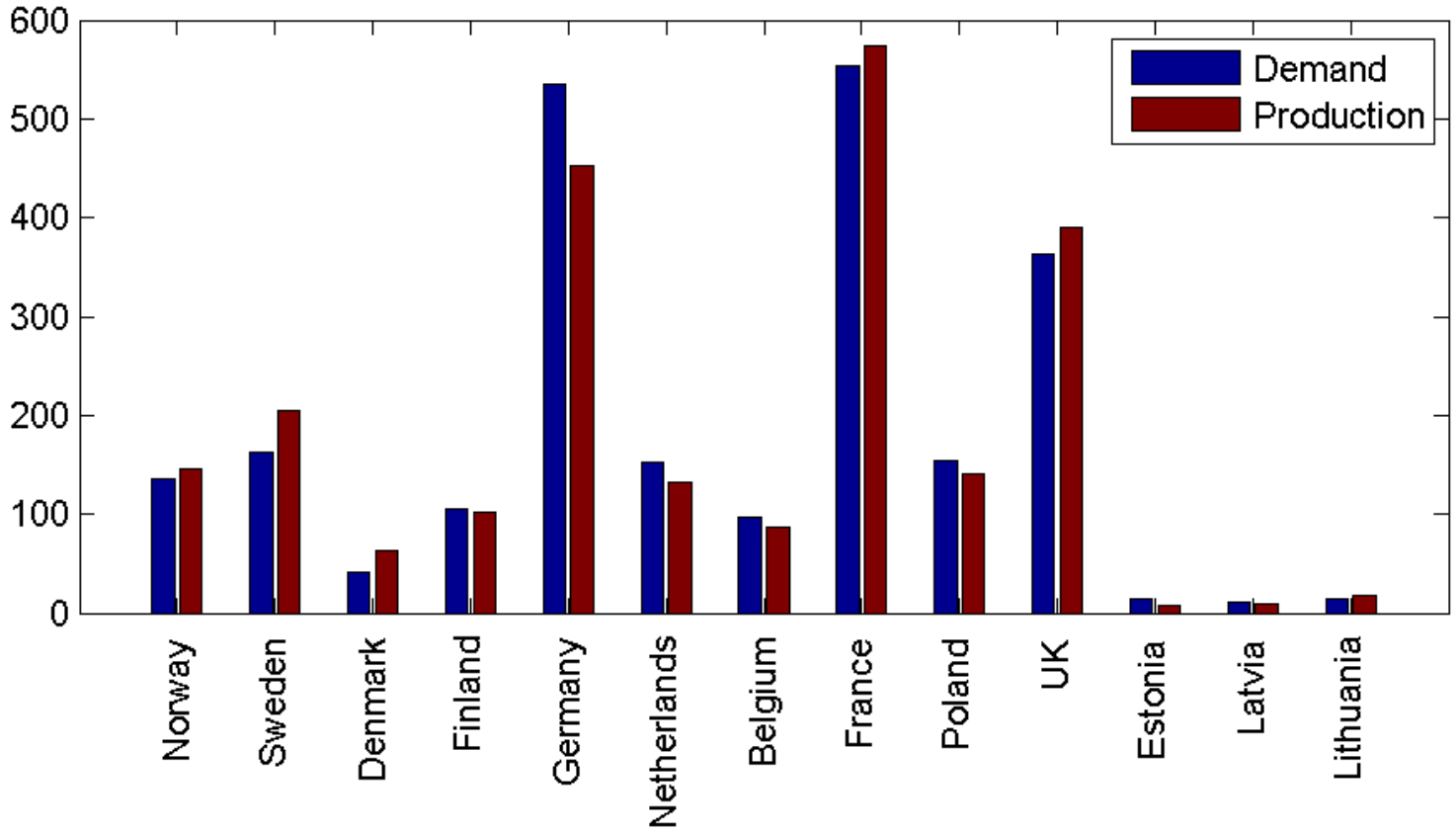
Assumptions of Baltic Sea Green Vision

- **Economic and Market**
  - **Economic and financial conditions: favourable**
  - **Carbon pricing: High carbon prices (94 €/ton**
- **Demand (increase due to economic growth)**
  - **Energy efficiency developments: Intermediate level**
  - **New usages (heat pumps, electric vehicles): maximum level**
- **Generation**
  - **RES: On track for 2050 roadmap, high degree of renewable energy**
  - **Conventional capacity: Much capacity is rebuilt for RES use (biomass, bio gas, etc.)**
  - **Back up capacity (nuclear, CCS) :**
  - **Nuclear: Some re-acceptance of nuclear, but no new capacity is built**
- **Grid**
  - **Smart grid: Load pattern impacted by demand response, el. vehicles & heat pumps**

2030 transmission capacities – before new projects

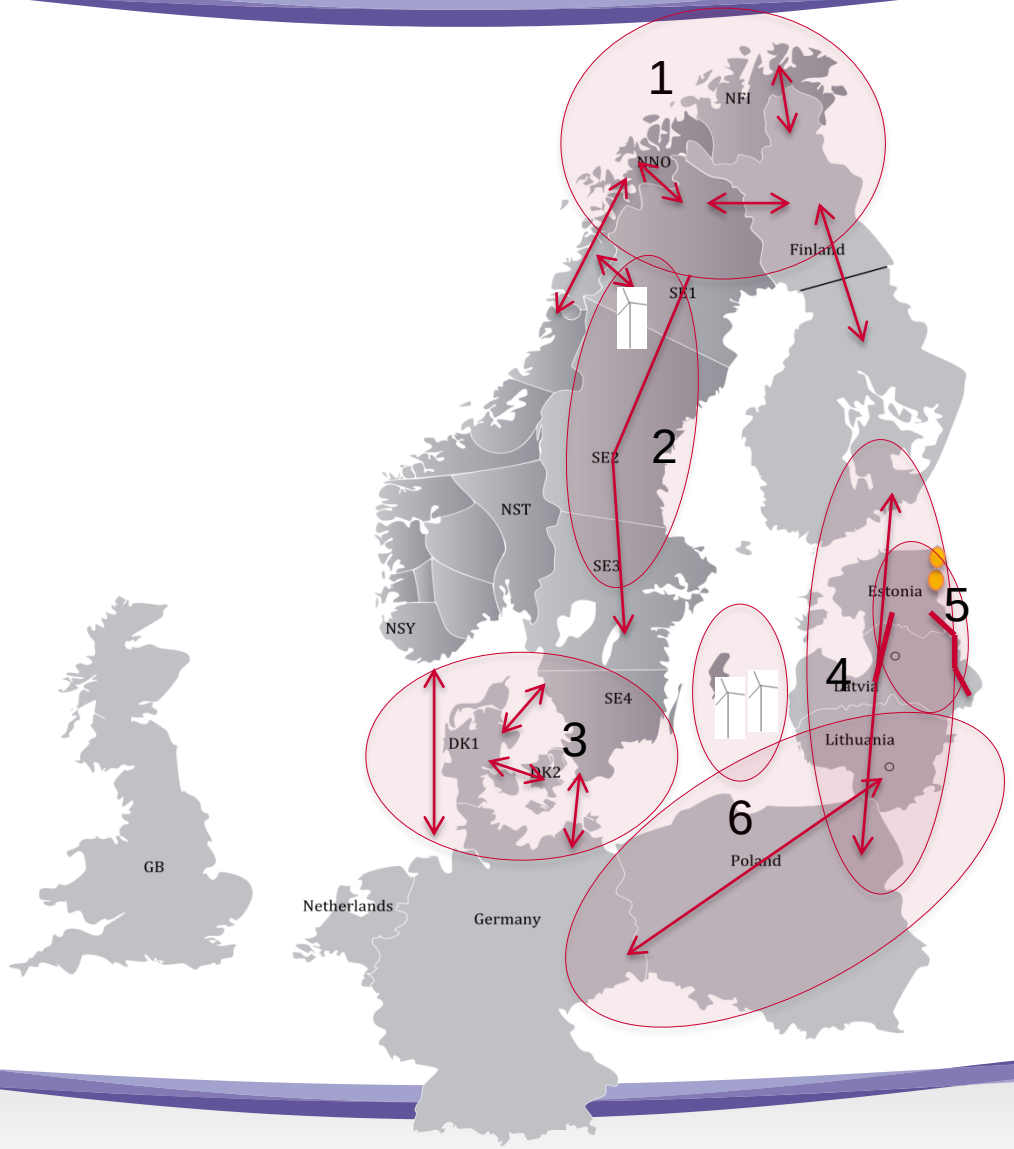


Simulated energy balances



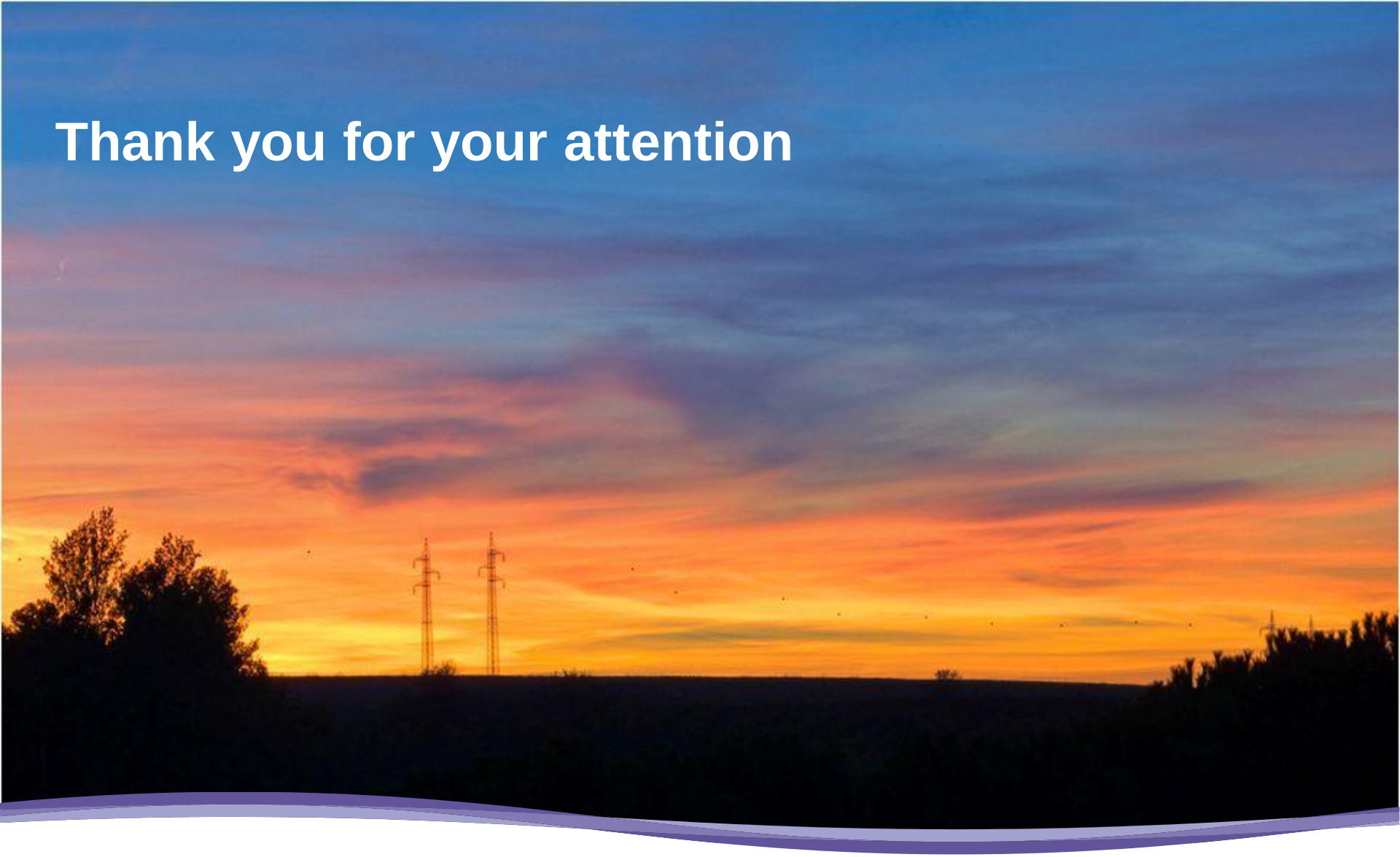
Identified areas of interest for 2020-2030 horizon

1. **Arctic area – new consumption and RES**
2. **North-south flow through Norway/Sweden/Finland**
3. **Increased capacity Nordics – Continental Europe/UK**
4. **North-South through Baltic states**
5. **Power flow control on Russian border**
6. **Baltic synchronous operation with Continental Europe**



Indicators

Grid transfer capabilité increase	Social and economic welfare (€)	Security of supply (MWh)	RES integration (MWh)	CO2 emissions variation (kt)	Losses variation (€)	Technical resilience (++/--)	Flexibility (++/--)	Costs (€)	Environmental sensibility (++/--)
MW	*Minor benefit*			*Neutral/ no clear trend*	*Negative benefit*			*High cost*	*High risk*
	Medium benefit							*Medium cost*	*Medium risk*
	High benefit							*Low cost*	*Minor risk*



entsoe

Reliable Sustainable Connected